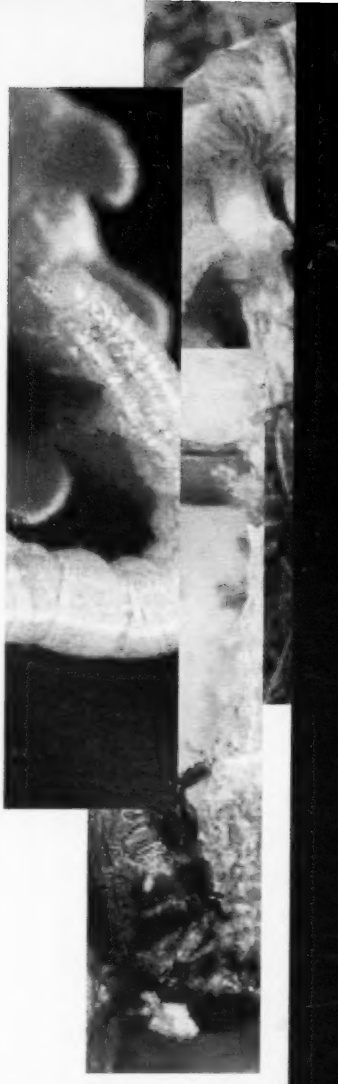
2009 Annual Report

Forest Health in Alberta

Government of Alberta

2009 Forest Health Program
Alberta Sustainable Resource Development



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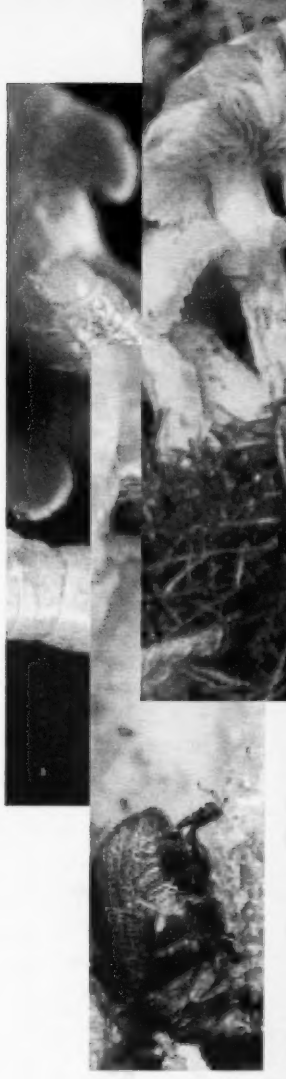
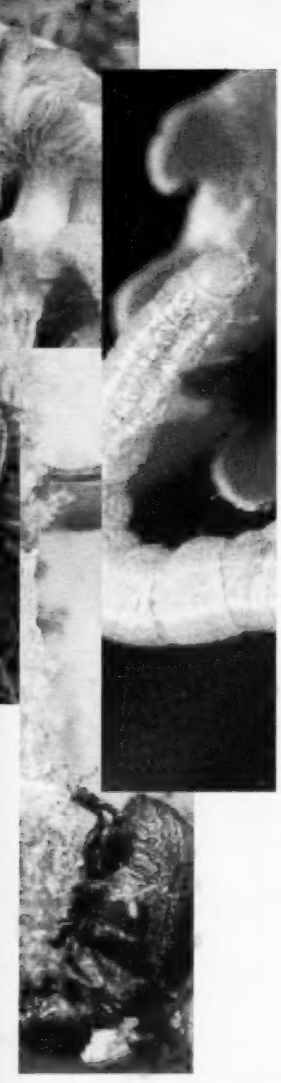




Executive Summary

This report contains details of forest pest surveys and pest management programs carried out under Alberta Sustainable Resource Development's (SRD) Forest Health Program in 2009.

The mountain pine beetle (MPB) was the most harmful forest pest in Alberta in 2009. During the 2008/09 beetle year (August 15, 2008 to August 14, 2009) mature pines with red crowns symptomatic of MPB were observed further north and east than before in northern Alberta. However, in areas where aggressive control action was taken in the 2007/08 beetle year the number of pines with red crowns declined in the 2008/09 beetle year. The results of long-distance aerial dispersal surveys carried out in summer 2008 indicated an influx of MPB into northwest Alberta. During the ground surveys carried out in fall 2008 surveyors detected 124,763 green-attack pines. The green: red attack ratios observed in fall 2008 indicated a fairly significant migration of beetles into northwest Alberta. The r-value (measure of population trends) surveys carried out in spring 2009 forecasted increased beetle population growth in infested areas of the Upper Peace Land Use Framework Region.

Under the beetle-focused strategy, 118,988 currently infested pines located at 12,133 sites were removed in the 2008/09 beetle year. Another 99,865 infested pines were removed by the MPB-affected municipalities under SRD's grant program. Under the healthy pine strategy, forest companies and individuals removed 2,090,928 cubic metres of wood from beetle-susceptible stands.

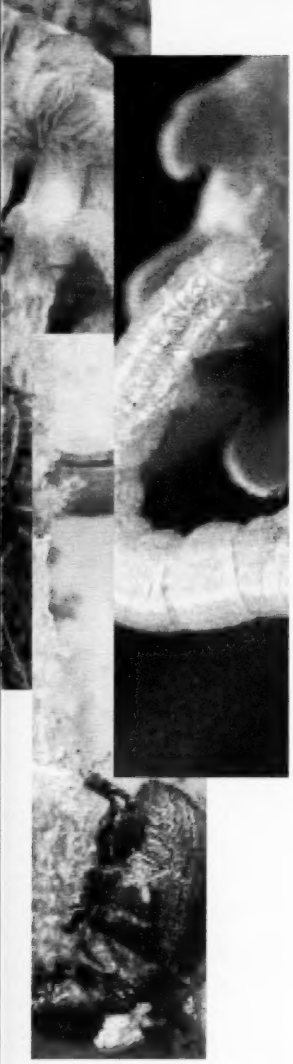
An unforeseen, massive in-flight from the west that occurred in summer 2009 scattered MPB over central and northern Alberta. Thus, further northward and eastward expansion of MPB infestation is expected during the 2009/10 beetle year.

The spruce budworm defoliated an estimated 167,861 hectares of spruce in 2009. This is a five per cent increase in defoliated area compared to that in 2008. However, the severely defoliated area decreased 46 per cent from 112,030 hectares in 2008 to 60,431 hectares in 2009. This was the first substantial decrease in defoliation severity observed since budworm populations began to increase in 2005. The moderately defoliated area increased by 122 per cent in 2009 to reach 107,430 hectares, compared to 48,378 hectares recorded in 2008. The forecast for 2010 calls for high risk of spruce budworm outbreaks occurring in northeast Alberta and in the Upper Hay Area in the northwest. The defoliation severity in 2010 in the northeast is expected to be severe in view of high egg mass densities sampled there in 2009

In 2009, the western spruce budworm infestation over Porcupine Hills in the southwest spread further south and west, reaching 30,779 hectares. This is a 37 per cent increase in the defoliated area. However, severity of defoliation was moderate in almost all of the affected areas.

As predicted in 2008, forest pest-caused aspen defoliation collapsed in 2009. This defoliation was confined to relatively small patches scattered over an estimated 207,243 hectares in the Green Zone. This is a 92 per cent decline compared to 2,854,878 hectares of pest-caused aspen defoliation recorded in 2008. This defoliation was attributed to the forest tent caterpillar, large aspen tortrix and Bruce spanworm. Most of this defoliation was observed in the northeast and southwest while patches of defoliated areas appeared in the northwest where tent caterpillar populations collapsed in 2007. Bands of light aspen defoliation were observed across central Alberta and in the southwest. Forest-pest-caused aspen defoliation is expected to increase in 2010 but will remain at relatively low levels in extent and severity.

Under the Invasive Alien Plant Species program the extent and severity of infestations due to seven major invasive alien plant species in the forested areas were surveyed. During these surveys, orange hawkweed was detected and destroyed for the first time in Alberta. SRD staff either used herbicides or hand-picking to control these plants. Control programs covered back country trails, vacant Crown land and SRD facilities. Two cooperatives involving SRD, industry and municipalities participated in controlling these invasive plant species. Weed awareness was increased through workshops and distribution of education materials. The Geographical Land Information Management and Planning System (GLIMPS) was used for data entry. A tablet personal computer was programmed to enter field data on invasive plant species.



Introduction

This report provides information on the programs carried out by the Forest Health Section of Alberta Sustainable Resource Development (SRD) in 2009 in relation to its business goals. Reference is made to other Forest Health-related programs in Alberta if those are either linked to or have a direct bearing on programs carried out by the Forest Health Section. Links are provided, where available, so that the reader can get more detailed information about such programs.

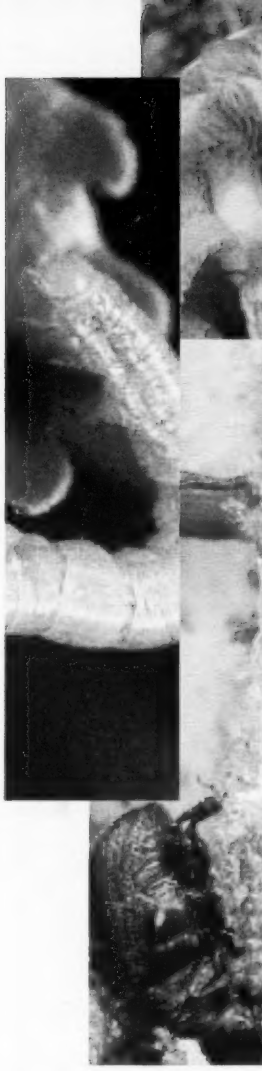
The forest-pest-related activities are reported on a calendar year basis, except those of the mountain pine beetle (MPB). The MPB program is reported on the "2008/09 beetle year basis, i.e., August 15, 2008 to August 14, 2009." This coincides closely with a complete generation of MPB from egg laying by adults after their flight in 2008 summer through development to flight of resulting MPB adults in summer 2009.

Until now forest-pest-related data have been reported on the basis of forest areas in relation to geographical regions of the province. Beginning in 2009, forest pest-related data are reported on a "Land Use Framework (LUF) Region" basis. Appendix I shows a map of Alberta's LUF regions, with forest areas embedded, so that the reader can relate between these administrative units.

In 2009, the mountain pine beetle was the focus of the Forest Health Program in Alberta. The major forest defoliators and invasive alien plants were the other high priority pests dealt with under the 2009 Forest Health Program.

The surveys reported in this document were carried out for operational purposes over forested Crown land in Alberta. These surveys do not necessarily cover the entire provincial land base. Although every effort is made to ensure accuracy and completeness of this report, its integrity is not guaranteed by SRD.

Forest Pest Conditions and Management Programs in 2009



Mountain Pine Beetle, *Dendroctonus ponderosae*

The objectives, goals and expected outcomes of Alberta's mountain pine beetle (MPB) management program are described in the Mountain Pine Beetle Management Strategy (Anonymous 2007a).

The MPB Management program is composed of:

1. Detection and assessment of current infestations

2. Action to control the MPB

The 2008/09 MPB program covers the period from August 15, 2008 to August 14, 2009. This time period approximately coincides with one generation of MPB, i.e., egg laying following beetle flights in summer 2008 through development of a new generation of beetles leading to their flights in summer 2009.

Detection and Assessment of Current Infestations

Overview Aerial Surveys

Heli-GPS surveys were carried out in fall 2008 to detect and record locations of pines with red crowns symptomatic of MPB infestations. The procedure for these surveys is described in the SRD Heli-GPS Manual (Anonymous, 2007b). These surveys were carried out in all MPB-infested areas except for a section of MPB infestation in northwest Alberta that was earmarked for remote sensing to detect pines with red crowns (Figure 1).

The fall 2008 survey results (Figure 1) indicated pines with red crowns distributed further north and east than ever before. In southwest Alberta, the number of pines with red crowns increased, compared to that in the previous year (Figure 2).

Figure 1.
Results of fall 2008 heli-GPS surveys showing locations of pines with red crowns suspected of being attacked by the mountain pine beetle in the 2007/08 beetle year in Alberta.

Figure 2.
Results of fall 2007 heli-GPS surveys showing locations of pines with red crowns suspected of being attacked by the mountain pine beetle in the 2006/07 beetle year in Alberta.

Long-Distance Dispersal Monitoring

Plots with aggregation pheromone-baited trees were established in July 2008, i.e., before 2008 beetle flights, to monitor long-distance aerial dispersal of beetles in Alberta. One plot per each strategically pre-selected township was set up in highly MPB-susceptible pine stands. The procedure for dispersal monitoring is described in the "Mountain Pine Beetle Detection and Management in Alberta" (Anon. 2008a).

Figure 3 shows occurrence of MPB hits at dispersal monitoring sites following 2008 flights. Most pine beetle dispersal activity was recorded adjacent to Banff National Park at the western edge of North Saskatchewan Land Use Framework (LUF) Region (Clearwater Area); southwest corner of the Upper Peace LUF Region (Foothills Area); northern part of Upper Athabasca LUF Region (Lesser Slave Area) and a band extending from the northwest to southeast of the Lower Peace LUF Region (Peace and Lesser Slave areas). These dispersal patterns, particularly those in the Lower Peace LUF Region, indicated fairly significant dispersal of beetles in to new areas of forested Crown land. However, no long-distance beetle dispersal was detected in plots located in the Lower Athabasca LUF Region (Lac La Biche Area). These results indicated first ever MPB migration into the Upper Hay Area in northern Alberta. There was no indication of long-distance beetle flights into the Southern Rockies Area in southern Alberta in 2008.

Ground Surveys to Detect Green Attacks

Ground surveys were carried out in fall and winter 2008 to detect green attacks in areas earmarked for beetle management in the 2008/09 beetle year. These surveys were based on pines with red crowns that were detected during heli-GPS surveys carried out in 2008 fall. Depending on the distribution of pines with red crowns, either concentric or transect surveys were carried out to find green attack trees. The procedures used for these surveys are described in the manual "Mountain Pine Beetle Detection and Management in Alberta" (Anon. 2008a). The results of these surveys are summarized in Table 1.

Table 1
The number of green-attack trees detected in Alberta during ground surveys carried out in areas earmarked for management during the 2008/09 mountain pine beetle year.

Corporate Area	No. of Green-Attack Trees Detected
Smoky	74,329
Lesser Slave	1,602
Clearwater	181
Peace	3,005
Southern Rockies	35,524
Foothills	9,922
Woodlands	200
Total	**124,763**

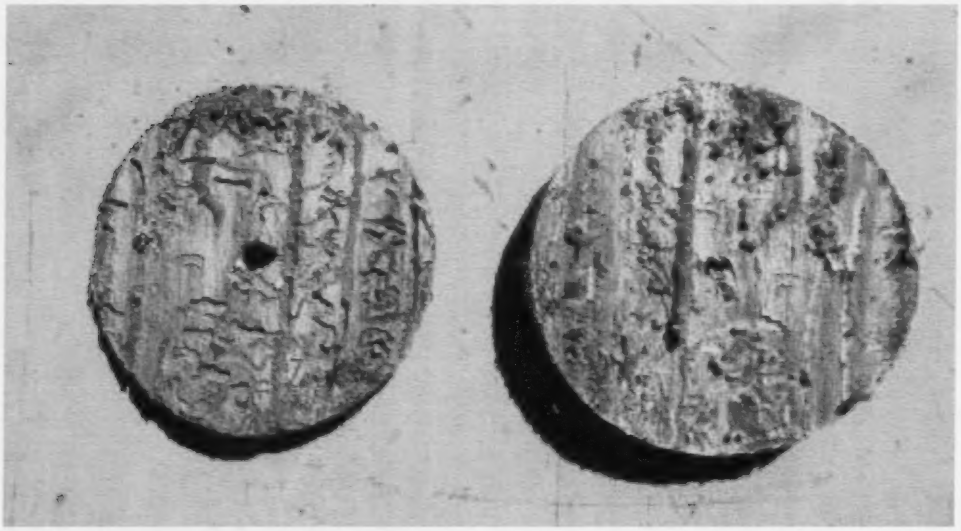
Figure 3
Results of the MPB long-distance aerial dispersal monitoring pheromone bait program carried out in July-October, 2008 in Alberta.

Population Trends

Green:Red Ratios

The green:red ratios, i.e., ratio of currently attacked trees with green crowns (green attacks) to one-year old attacked trees with red crowns (red attacks), were determined by following the procedures described in the Mountain Pine Beetle Detection and Management in Alberta (Anon. 2008a). A green:red ratio of >1 indicates an increasing population and a ratio of <1 indicates a declining population. A green:red ratio of >7 indicates the possibility of beetle immigration to the site.

Figure 4 shows results of the green:red ratio surveys observed in areas in northern Alberta in 2008 fall. These ratios were relatively low in Kakwa-Willmore Interprovincial Park in the southwest corner of the Upper Peace LUF Region. The green:red ratios were very high (over 1:17) indicating significant MPB immigration to some parts of the Lower Peace LUF Region. In central Alberta, these ratios did not indicate any areas where large-scale MPB migration has occurred.



Bark samples collected to determine r-value

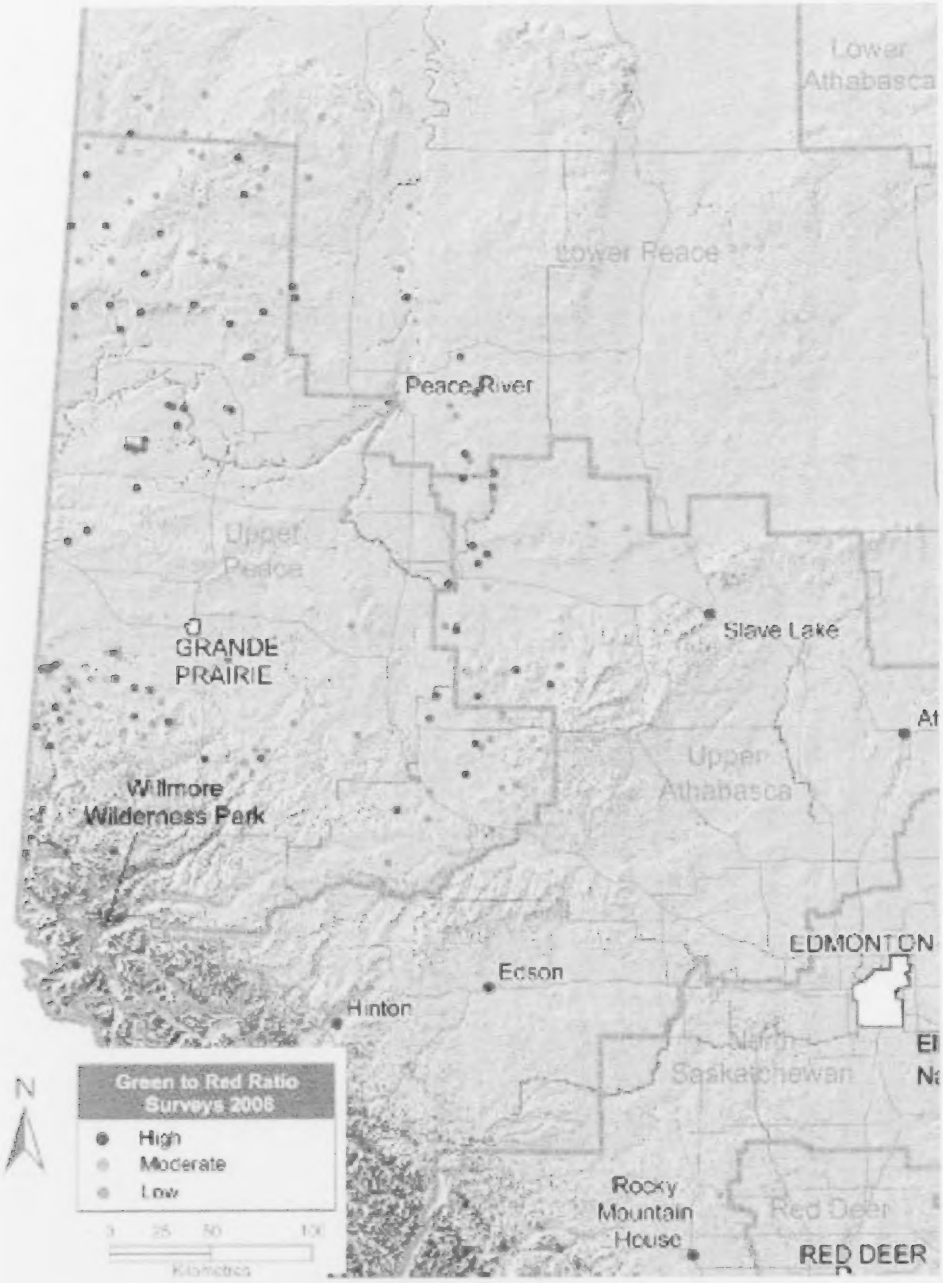


Figure 4
Results of green:red ratio surveys carried out in northern Alberta in 2008 fall.

Figure 5
Forecast on MPB population trends in the 2008/09 beetle year, based on an r-value survey conducted in 2008 spring in Alberta.

R-values

R-value is another measure of the rate of increase of populations. R-value at a given site is the standardized average ratio of the number of beetles that entered the bark samples taken from the bole of infested trees to the number of live MPB brood found in those samples. The sampling procedure for r-value determination is described in the "Mountain Pine Beetle Detection and Management in Alberta (Anon. 2008a)."

In each climatic zone, 15–20 sites were selected based on access, number of infested trees, spatial coverage and climatic suitability for MPB as identified by a model developed by Carroll et al. in 2004. R-values were determined in mid-late spring in 2008 after most control operations were completed.

The population forecast for 2008/09, based on r-values determined in 2008 spring, is shown in Figure 5. R-values were used to demarcate areas where relatively better MPB population growth was expected in the 2008/09 beetle year. Based on these results MPB population growth was expected to be higher in the Upper Peace LUF Region.

MPB Control Program

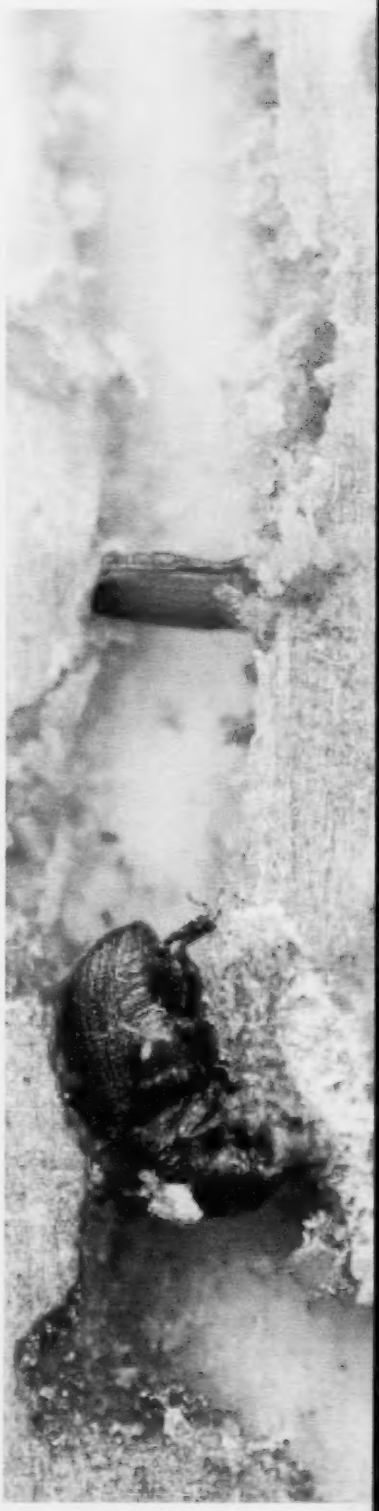
Two control strategies were used to achieve the objectives of the provincial mountain pine beetle management program.

I. Beetle-focused Strategy to reduce MPB populations in infested areas in the short-term

II. Healthy Pine Strategy to reduce amount of MPB-susceptible pines across the province in the long-term

Refer "Mountain Pine Beetle Management Strategy" (Anon. 2007a) for details on these strategies.

A Geographical Information System (GIS)-supported Decision Support System (DSS) was formulated to prioritize MPB-infested areas for control under the Beetle-Focused Strategy. This system helps forest managers in deciding which areas are to be treated to meet provincial objectives. This DSS, based on beetle biology and risk of spread, was used to categorize beetle-infested stands into five levels of priority varying from very low; low; moderate; high to extreme (Anon. 2007a). The DSS was further refined by making use of high green:red ratios that indicated potential beetle immigration. Those stands with MPB immigration were elevated into higher rankings with high control priority despite having low r-values and/or low numbers of infested trees.



In the Decision Support System, sites with higher r-values received higher priority in surveys and treatment. Those sites with the highest 25 per cent of r-values were placed in the high classification; those with the lowest 25 per cent in the low classification, and those with the remaining r-values were placed in the medium classification.

Each MPB site in the province was ranked based on the DSS. In the Leading Edge Zone (see below) all the sites with extreme, high and moderate rankings were surveyed and treated; in the Holding Zone all the sites with extreme and high rankings were surveyed and treated; and, in the Inactive Holding Zone SRD did not carry out either surveys or control actions. The 2008/09 MPB management zones are shown in Figure 6.

The number of infested trees in a patch was taken into account in prioritizing it for control. In the Leading Edge Zone patches with ≥3 trees were prioritized while in the Holding Zone patches with ≥25 trees were prioritized for survey and treatment.

The stand susceptibility index (SSI) – based on the per cent, age and size of pines, together with climatic suitability to MPB – was used to classify stand susceptibility to the MPB. SSI was used to prioritize stands for control action.

The connectivity, a relative measurement of the proximity of MPB-susceptible stands in a defined area, was also taken into account in determining control action. The areas where MPB consistently undergoes a two-year life cycle (as determined by MPB degree-day requirement) were excluded from the treated area.

Figure 6
MPB management zones in Alberta in the 2008/09 beetle year.

Under the "Beetle-focused Strategy," 118,988 beetle-attacked trees were removed by SRD crews and contractors in the 2008/09 beetle year. These trees were found at 12,133 sites. The details of this control program are shown in Table 2.

In addition, several municipalities removed 99,865 MPB-infested trees under the SRD grant program. The number of pine trees removed under this program by each municipality is shown in Table 3.

Table 2
The number of beetle-infested pine trees that were removed under SRD's MPB control program in the 2008/09 beetle year in Alberta.

Corporate Area	Number of Sites	Total Number of Trees Removed
Southern Rockies	5,986	30,668
Clearwater	89	173
Foothills	1,236	9,986
Woodlands	85	201
Smoky	4,076	73,425
Lesser Slave	370	1,530
Peace	291	3,005
Total	12,133	118,988

"Chipper" at work processing beetle-infested trees

Table 3
The number of MPB-infested trees removed by municipalities under SRD's grant program in the 2008/09 beetle year in Alberta.

Corporate Area	Municipality	No. of pine trees removed
Peace	Town of Peace River	693
Smoky	City of Grande Prairie	242
Foothills	Town of Grande Cache	71
Southern Rockies	MD of Bighorn	12
	Canmore Corridor	739
	MD of Crowsnest Pass	974
Lesser Slave	MD of Big Lakes	1,789
Smoky	South Peace Municipalities (County of Grande Prairie; Saddle Hills County; MD of Spirit River; Birch Hills County; and MD of Greenview)	95,345
Total		**99,865**

Under the Healthy Pine Strategy, twenty forest companies and individuals harvested 2,090,928 cubic metres from pine stands with high MPB risk.

In summary, the results of the 2008/09 MPB control program show that the Forest Health Program met Strategy 3.2 under SRD Business Goal 3, i.e., to implement aggressive actions to maintain forest health and to manage mountain pine beetle in cooperation with industry, municipal and federal governments. The long-distance aerial dispersal bait program helped to detect occurrence of MPB in previously un-infested areas. The dispersal baits also indicated some eastward and northward dispersal of MPB in the 2008/09 beetle year. The MPB-infested trees detected and determined to be priority through the DSS were removed under Response Levels 1 and 2. In addition, 2,090,926 cubic metres of pine were removed from pine stands under Healthy Pine Strategy.

Outlook for 2009-2010

Figure 7 shows results of the long-distance aerial dispersal baiting program carried out in July-September 2009, i.e., in 2009/10 beetle year. These results indicated a massive, long-distance dispersal of MPB across central- and northern Alberta. Most baited-trees in these areas had beetle attacks; some sites had spill-over attacks as well. For the first time MPB were detected in baited-trees and as spill-over attacks in the Lac La Biche Area embedded in the Lower Athabasca LUF Region. As well, MPB were detected further north in the Upper Hay Area embedded in the Lower Peace LUF Region. Thus, compared to occurrence of MPB in the 2008/09 beetle year, further northward and eastward expansion of MPB infestation is expected in the 2009/10 beetle year.

Figure 8 shows spatial distribution of pines with red crowns, suspected of being caused by MPB attacks, in areas covered during heli-GPS surveys carried out in fall 2009 in the 2009/10 beetle year. These show potential to have more pines with MPB attacks in Alberta in the 2009/10 beetle year compared to that in the 2008/09 beetle year. These results confirm that MPB infestations across Alberta can be more widespread in 2009/10 compared to that in 2008/09.

Figure 7
Results of the MPB long-distance aerial dispersal baiting carried out from July to September 2009 in Alberta.

Figure 8. Locations of pines with red crowns suspected of being attacked by mountain pine beetle in areas heli-GPS surveyed in September 2009 in Alberta (Note: Remote sensing was to be used to detect pines with red crowns in some parts heli-GPS surveys did not cover in Smoky, Peace and Upper Hay areas).

Spruce Budworm, *Choristoneura fumiferanas*

Aerial Surveys

Each year, Forest Health Officers and/or Technicians carry out aerial surveys to monitor extent and severity of spruce budworm infestations on forested Crown land. The goals of this program are twofold:

1. To keep a historical record of these infestations; and,

2. To assess the need to take actions if spruce budworm infestations compromise management objectives of the affected lands.

The aerial survey methods used in these surveys are described in "Forest Health Aerial Survey Manual" (Ranasinghe and Kominek, 1999).

The results of these surveys are shown in Figure 9 and in Table 4.

Spruce budworm larvae on a white spruce shoot

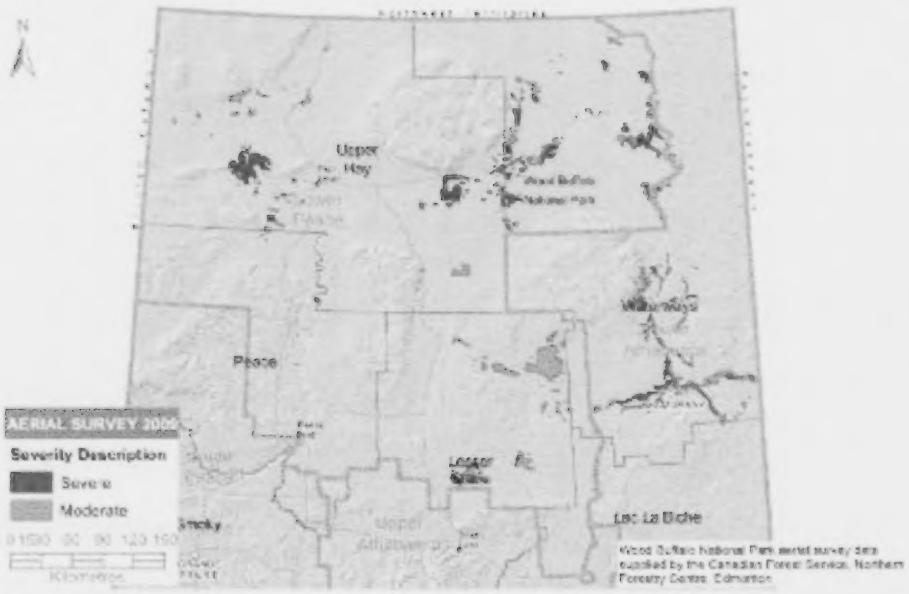


Figure 9
Spatial distribution of aerially visible spruce budworm defoliation on forested Crown land surveyed in Alberta in 2009.

Spruce budworm bud entry holes

Overall, spruce budworm defoliated area in the surveyed land increased by about five per cent in 2009 (Figure 9) compared to that in 2008 (Table 4 and Figure 10).

Table 4
The number of hectares of spruce budworm defoliation, under each severity category, recorded[1] during aerial surveys carried out in Alberta, 2008 vs. 2009.

	Moderate	Severe	Total
2008	48,378	112,030	160,408
2009	107,430	60,431	167,861
Change[2]	122%	- 46%	5%

[1]Excluding Wood Buffalo National Park
[2]Percent change in defoliated area compared to the corresponding value in 2008

The area with moderate defoliation increased by 122 per cent and the area with severe defoliation decreased by 46 per cent in 2009 compared to that in 2008 (Table 5). This is due to a decrease in the area with severe defoliation in northeast Alberta (Figure 10). This is the first decline of the severely defoliated area in northeast since budworm infestation collapsed in 2005.

The extent of spruce budworm defoliated areas in each LUF Region is shown in Table 5.

Table 5
The extent and severity of defoliation recorded in the LUF regions infested with spruce budworm in Alberta, 2009.

LUF Region	Corporate Area/s	Extent of Defoliation (ha) Moderate	Severe	Total
Lower Athabasca	Lac La Biche Waterways	43,583	16,991	60,574
Lower Peace	Lac La Biche Lesser Slave Peace Upper Hay Waterways	63,550	43,440	106,990
Upper Athabasca	Lac La Biche	297	--	297
Sub- Total		107,430	60,431	
Grand Total		**167,861**		

Damage caused by spruce budworm larval feeding

In northeast Alberta the defoliated area decreased 39 per cent, from 91,048 hectares in 2008 to 61,937 hectares in 2009. The severely defoliated area in northeast Alberta decreased 76.7 per cent, from 73,986 hectares in 2008 to 17,198 hectares in 2009. The moderately defoliated area increased from 17,062 to 44,739 hectares during this period. This is the first substantial decline either in the extent or in severity of budworm defoliation in northeast Alberta since budworm infestations there began to increase in 2005 (Figure 11).

In northwest Alberta, there was a substantial increase in the defoliated area from 69,419 hectares in 2008 to 101,704 hectares in 2009. This is almost a 46 per cent increase in the extent of defoliation. The severely defoliated area increased slightly (7.9 per cent) from 38,042 hectares in 2008 to 41,083 hectares in 2009. However, the moderately defoliated area increased substantially (93.3 per cent) from 31,377 hectares in 2008 to 60,681 hectares in 2009 (Figure 12).

No defoliation due to the spruce budworm was reported from southwest Alberta in 2009.

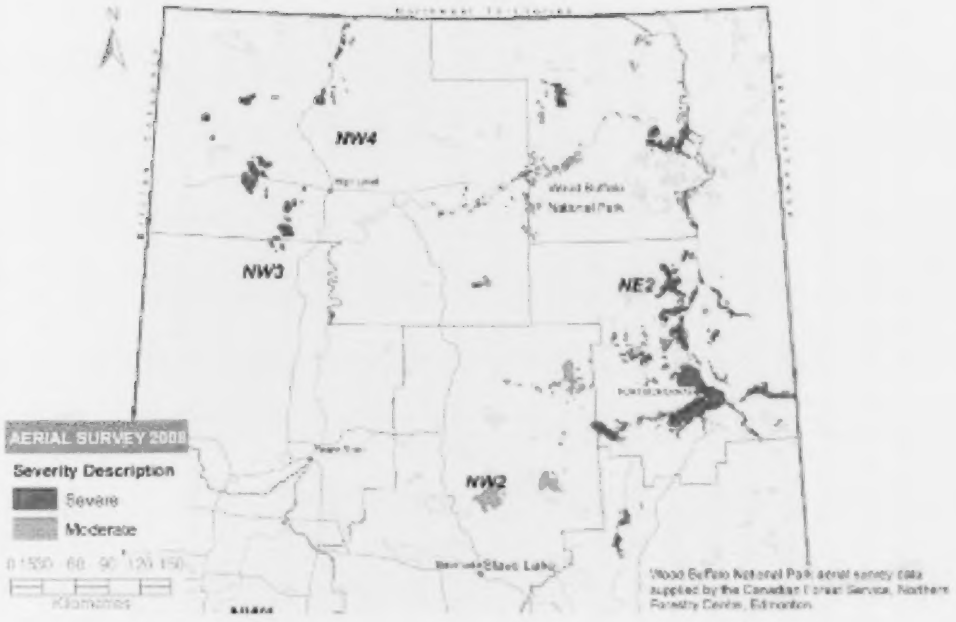


Figure 10
Spatial distribution of aerially visible spruce budworm defoliation on forested Crown land surveyed in Alberta in 2008.

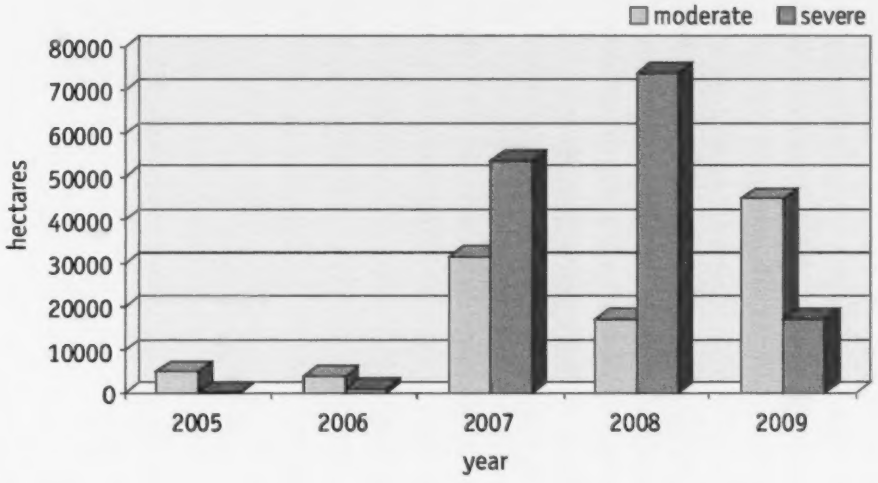


Figure 11
The extent of moderate vs. severe spruce budworm defoliation in northeast Alberta, 2005 – 2009.

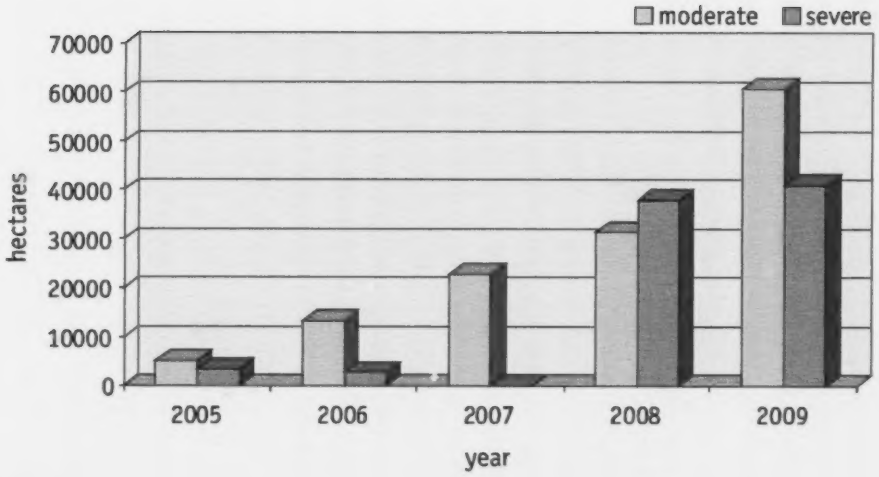


Figure 12
The extent of moderate vs. severe spruce budworm defoliation in northwest Alberta, 2005–2009.

Silky webbing produced by spruce budworm larvae

Forecast for 2009

Multipher-I® traps baited with synthetic lures containing female spruce budworm sex pheromone are used annually to monitor male budworm moth populations at strategically selected sites across forested Crown land. The procedure for deploying these traps is described in the Spruce Budworm Management Guide (Ranasinghe and Kominek, 1998). In 2009, two traps with lures were placed at each of the 222 trap sites across the province. Surveys were completed at 203 of these sites. Figure 13 shows the results of these surveys.

Based on the pheromone-baited trap catches, most of the monitoring sites in the Lower Athabasca LUF Region (Waterways and Lac La Biche areas) have high risk of spruce budworm infestations occurring in 2010. In this region, trap catches indicated high risk of infestations at 71 per cent of the 28 trap sites in the Lac La Biche Area and at 95 per cent of the 22 trap sites in the Waterways Area. Risk of infestations occurring in 2010 in the Lac La Biche Area was low in 14.5 per cent and moderate in 14.5 per cent of the plots. In the Waterways Area, risk of infestations occurring in 2010 was moderate in five per cent of the plots. Overall, spruce budworm infestations are very likely to continue in these areas in 2010. However, based on the results of a limited egg mass survey carried out in this region in 2009 (Tom Hutchison, personal communication), the extent and severity of budworm defoliation in 2010 is expected to be high.

In the Lower Peace LUF Region (Upper Hay, Peace and Lesser Slave areas) the risk of spruce budworm infestations occurring in 2010 is low to moderate at most trap sites. In the Upper Hay Area, risk of infestations occurring in 2010 is high at five out of 98 trap sites (5 per cent); moderate at 58 sites (59 per cent) and nil-low at 35 sites (36 per cent). The trap sites located along the Wabasca drainage and at a few sites located along the Peace River in the Lower Peace LUF Region have moderate risk of infestations occurring in 2010. The rest of the trap sites in this region will have nil-low risk of spruce budworm infestations occurring in 2010 (Figure 13).

All the other trap sites scattered in the central and southwest parts of the province (Smoky, Woodlands, Foothills, Clearwater and Southern Rockies areas) had trap catches that indicated low risk of spruce budworm outbreaks occurring in 2010. These include trap sites located at higher elevations that are known to be inhabited by the two-year cycle budworm, *C. biennis*. However, trap catches at these two-year cycle budworm sites are expected to be high in 2010, as it normally happens in even years. Some of these sites may have aerially visible defoliation in 2010. In 2010, the risk of spruce budworm infestations occurring is low in the Upper Peace, Upper Athabasca, North Saskatchewan and South Saskatchewan LUF regions (Figure 13).

Figure 13
Forecast based on male moth catches in pheromone-baited traps set up in 2009, on risk of spruce budworm infestations occurring in 2010 in Alberta.

Western Spruce Budworm, *C. occidentalis*

Figure 14 shows the results of the 2009 aerial overview survey carried out to determine the extent and severity of western spruce budworm defoliation in the Southern Saskatchewan LUF Region in southwest Alberta. These results show moderate defoliation (35-70 per cent) over most of the affected areas and severe defoliation (over 70 per cent) in a relatively small pocket west of Highway 22. In 2009, this infestation expanded further west and south compared to that occurred in 2008 (Figure 15). The extent of this defoliation increased from 22,471 hectares in 2008 (Figure 15) to 30,779 hectares in 2009. Out of this defoliated area, 127 hectares had severe defoliation and the remainder had moderate defoliation.

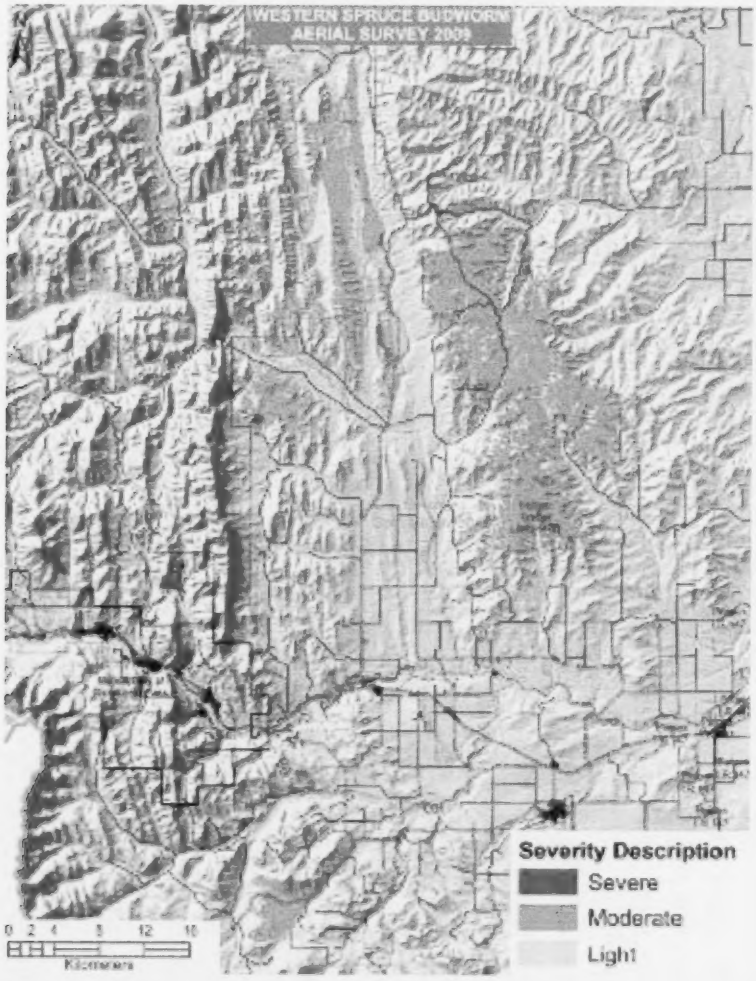


Figure 14
Spatial distribution of aerially visible defoliation recorded, by severity categories, during western spruce budworm defoliation surveys carried out in 2009 in Alberta.

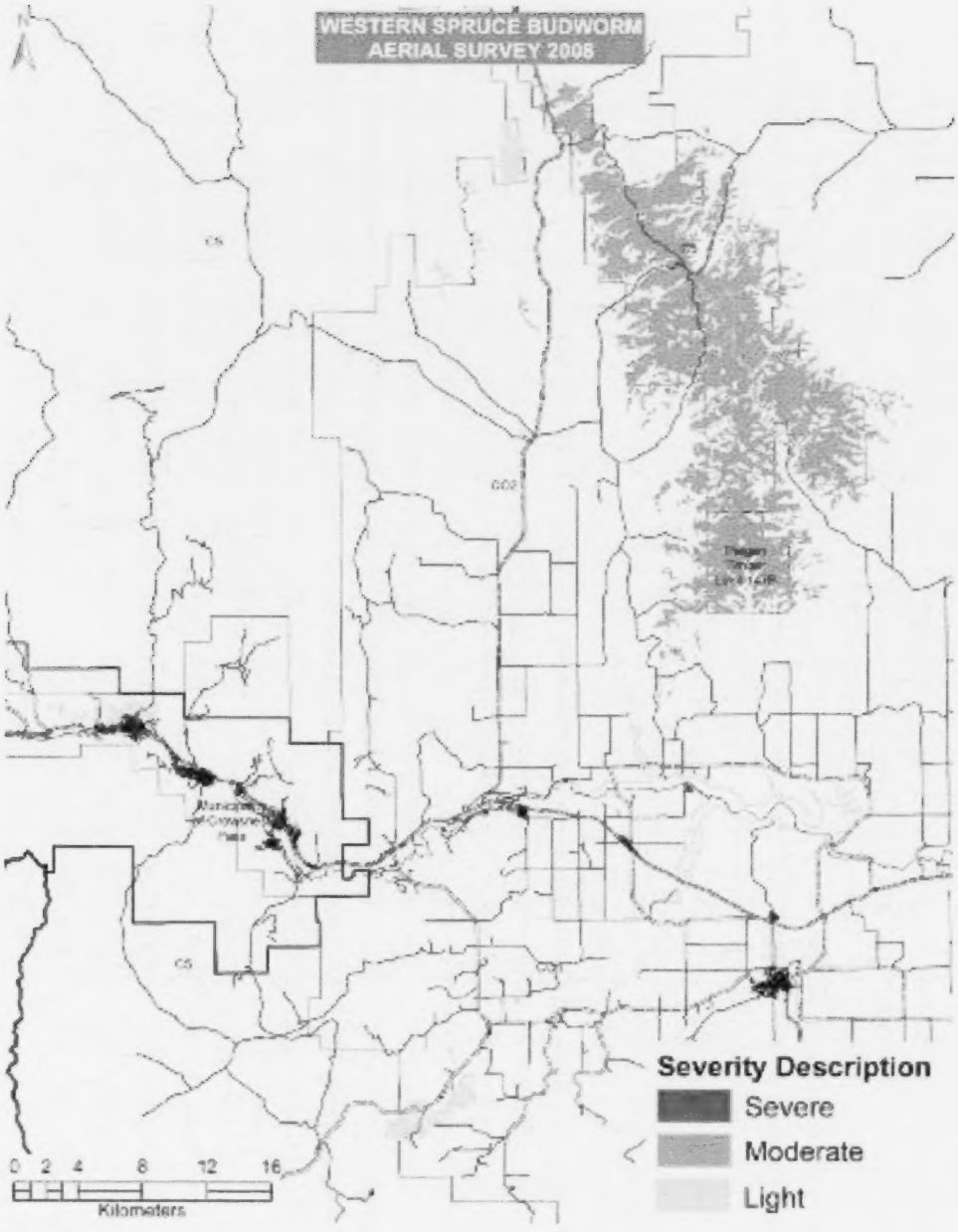


Figure 15
Spatial distribution of aerially visible defoliation recorded, by severity categories, during western spruce budworm defoliation surveys carried out in 2008 in Alberta.

Aspen Defoliators

Forest Health Officers and/or Technicians carry out annual aerial overview surveys to record the area over which aspen defoliation is scattered and to estimate the intensity of defoliation by severity categories. The survey procedure described in the "Forest Health Aerial Survey Manual" (Ranasinghe and Kominek, 1999), modified to include use of a tablet personal computer linked to a global positioning system, was used for these surveys. The objective of this exercise is to maintain a historical record of aspen defoliation in the province.

Figure 16 shows the results of these surveys. In 2009, aspen defoliation was scattered over an estimated 207,243 hectares. Most (87 per cent) of this defoliation was light (<35 per cent) and the remainder was moderate (35 – 70 per cent) in intensity. The extent and severity of this defoliation across the LUF regions is shown in Table 6. Aspen defoliation observed in 2009 was attributed to the forest tent caterpillar (*Malacosoma disstria*), large aspen tortrix (*C. conflictana*) and Bruce spanworm (*Operophtera bruceata*). Table 7 shows the extent and severity of aspen defoliation caused by these pest species in the areas surveyed.

In 2009, as forecasted in 2008, populations of the above aspen defoliators collapsed in Alberta. This collapse is mainly attributed to a late spring cold snap in the northwest and natural enemies of these pests in the northeast. The extent of insect pest caused aspen defoliation in 2009 (207,243 ha) was a 92.8 per cent drop compared to the 2,854,878 hectares over which defoliation was distributed in 2008 (Figure 17). No severe aspen defoliation was found, except in Wood Buffalo National Park, in areas surveyed in Alberta in 2009.

Table 6
The extent of forest insect caused aspen defoliation in 2009, by severity categories, in Land Use Framework Regions of Alberta[1]

LUF Region	Gross Area of Defoliation (ha)			
	Light	Moderate	Severe	Total
Lower Athabasca	83,621	1,525	0	85,146
Upper Athabasca	23,628	106	0	23,734
Lower Peace	8,662	66	0	8,728
Upper Peace	16,777	1,238	0	18,015
North Saskatchewan	267	0	0	267
South Saskatchewan	48,045	23,308	0	71,353
Grand Total	**181,000**	**26,243**	**0**	**207,243**

[1] Excluding Wood Buffalo National Park and Prairies

Table 7
The extent of forest insect caused aspen defoliation in 2009, by pest species, Alberta[1]

Pest	Light	Moderate	Severe	Total
Bruce Spanworm	40,429	1,344	0	41,773
Forest Tent Caterpillar	92,526	1,591	0	94,117
Large Aspen Tortrix	48,045	23,308	0	71,353
Total	**181,000**	**26,243**	**0**	**207,243**

[1] Excluding Wood Buffalo National Park and Prairies

Forest tent caterpillar egg masses

Figure 16
Spatial distribution of aerially visible aspen defoliation, by severity categories, in areas surveyed in 2009, Alberta.

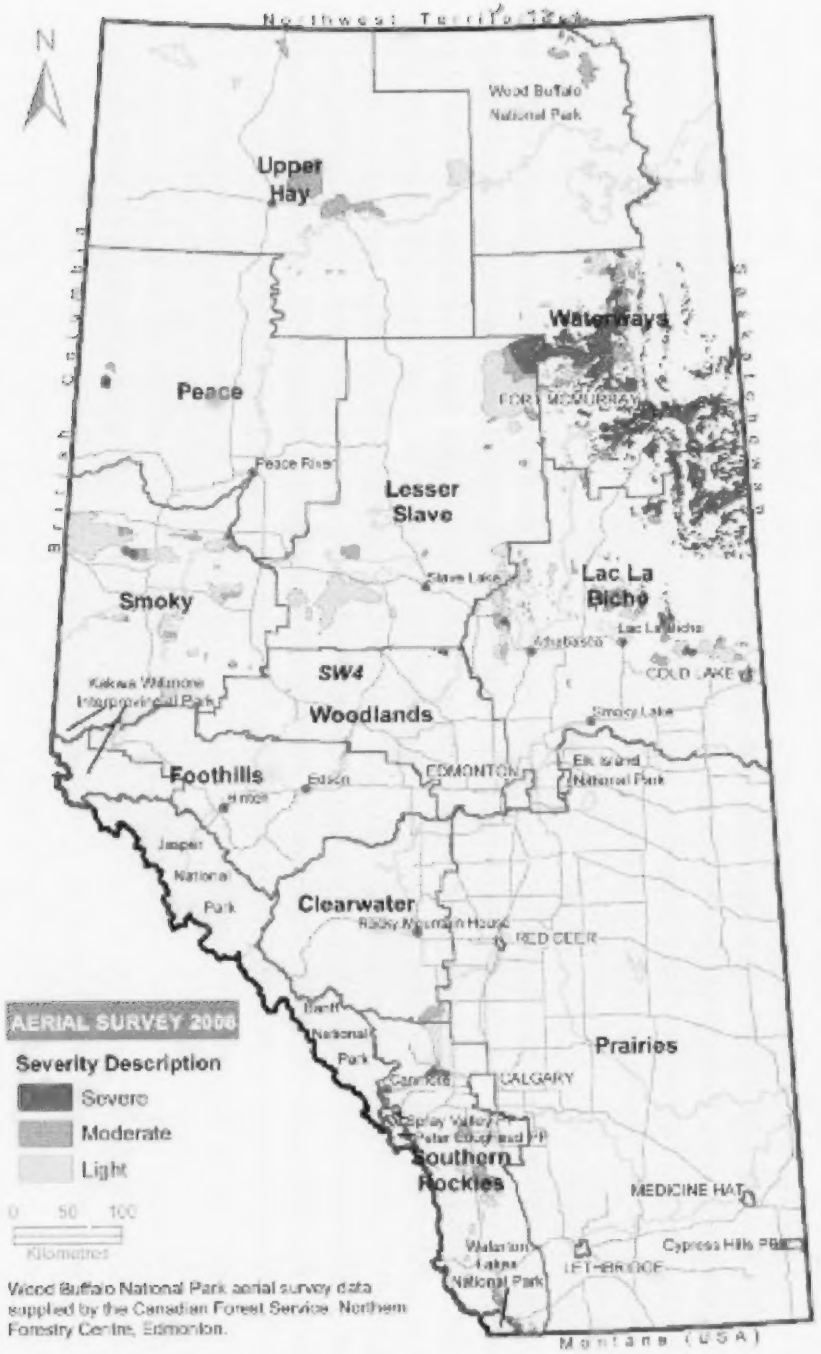
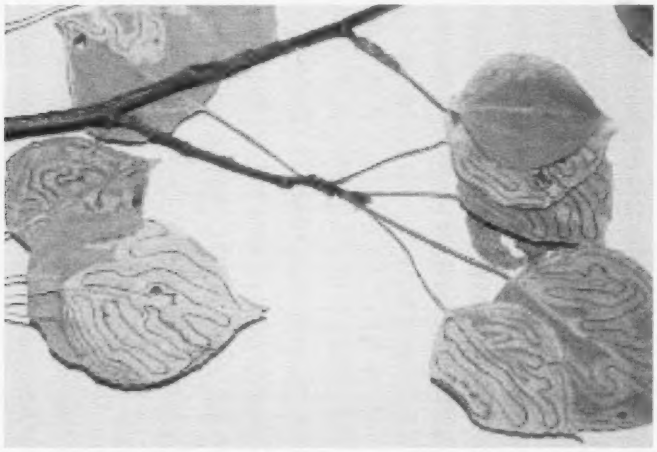


Figure 17
Spatial distribution of aerially visible aspen defoliation, by severity categories, in areas surveyed in 2008, Alberta.

Other Noteworthy Pests

In the Lower Peace LUF Region, aspen serpentine leafminer (*Phyllocnistis populiella*) populations were quite high and widespread along highway 35, from Meander River to the Alberta – Northwest Territories border. In July and August, aspen stands along the highway were silvery in appearance due to leafminer larval mining of aspen leaves.

In this region, extensive willow leaf damage was observed in the Rainbow Lake, High Level, Fort Vermilion, Keg River and Zama areas. A heavy build up of the willow leafminer (*Micrurapteryx salicifoliella*) populations was the cause of this damage.



Aspen serpentine leafminer damage

Willow leafminer damage

Collaborative Pest Monitoring Programs

The Forest Health Section of SRD participated in the annual gypsy moth monitoring program carried out by the Canadian Food Inspection Agency (CFIA). The CFIA protocol was followed in deploying pheromone-baited traps at strategically selected locations throughout the Green Area of the province. No gypsy moths were trapped at the 90 SRD sites completed.

Forest Health personnel in the Lac La Biche - Waterways Area collaborated with a researcher at the University of Alberta in setting up 50 pheromone-baited traps to monitor forest tent caterpillar populations. The Forest Health personnel provided in-kind support first to deploy traps and later on to collect the trap catches. These Forest Health personnel also participated in providing in-kind support to deploy seven traps with lures to detect presence of exotic forest pests in the Lac La Biche - Waterways Area. This was part of a large-scale monitoring program to detect any exotic forest pest introductions to Alberta. This study was coordinated by a contractor working for the Society to Prevent Dutch Elm Disease (STOPDED). The specimens collected in the Lac La Biche – Waterways Area traps were shipped to the contractor who sorted and forwarded those specimens to taxonomists for identification.

Disorders

During aerial surveys trees affected by water-logging, storm damage and red-belt were observed in the Upper Athabasca LUF Region (Foothills Area).

Invasive Alien Plant Species

2009 Invasive Alien Plant Species Program

Introduction

In 2009, Forest Health regional staff took a new and a proactive approach to invasive plant management issues. Following provincial directives, this new approach allowed more localized involvement and commitment leading to more field level control efforts.

This year, the following provincial mandates were fulfilled under this program:

- inventory and control of invasive plants on SRD dispositions and vacant Crown land;
- initialization and/or continuation of localized weed cooperatives; and
- ongoing education and awareness.

Invasive Plant Detection, Surveys and Distribution

First time ever, orange hawkweed (*Hieracium aurantiacum*) was observed in the County of Athabasca in 2009; this is most likely the first recording of this species in Alberta.

Sites surveyed in 2009 included fire lookout towers, Sacramento gauges, fire bases, campgrounds and cabins, gravel pits, as well as vacant Crown land.

Figures 18-23 show occurrence of six prominent invasive plant species in 2009, in relation to historic survey information. Canada thistle, tall buttercup, and oxeye daisy were the predominant invasive plant species in the province in 2009.

Invasive Plant Management

No municipal weed notices were issued to SRD this year for invasive plants on vacant Crown land. The vacant Crown lands treated were primarily recreation sites such as random campsites and quad trails.

Because of access problems, backcountry weed sites reported by guardians have been neglected for many years. This season, a portion of the control budget was used to access these sites. Backpack sprayers were used to control tall buttercup, oxeye daisy, white cockle, and wild caraway around camping sites as well as along trails.

During 2008, various dispositions in the Foothills Area were inspected. If deemed infested, letters were sent to the disposition holders asking them to control their infestations. This year, these sites were re-inspected to ensure compliance. SRD received many letters from various stakeholders demonstrating control efforts.

As well, this year a new approach was taken for controlling invasive plants on Crown land to increase productivity and to decrease cost of herbicide spraying. Between the end of June and early August, a Foothills Area Forest Health Technician with a pesticides applicator license, led the weed spray program. This technician was able to control weeds at 23 sites (56 ha) on vacant Crown land and at SRD facilities.

A hound's tongue infestation, found near Dutch Creek Road in the Southern Rockies Area, was immediately hand pulled by SRD staff because hound's tongue has never been recorded in this area. Controlling this invasive plant species was extremely important because it is shade tolerant and has the potential to spread throughout the region, unless proper steps were taken to control it.

All co-operative spray projects planned and organized by SRD for the 2009 season were successful. For example, in the Clearwater Area a three-year cooperative project between SRD and Sundre Forest Products is significantly reducing wild caraway populations. Other successful weed co-ops included the Amadou as well as Yellowhead County.

The Amadou area (approximately 70 km northeast of Athabasca) was selected as a potential area for an invasive plant management cooperative in 2007. In this area scentless chamomile, among other noxious weed species, had spread to epidemic levels along roads, dispositions, cut-lines and cut-blocks. To address this problem the "Amadou Weed Cooperative Group" was created in 2008. In 2009, weeds at 103 sites were either mechanically or chemically controlled through cooperative efforts. The responsibilities of invasive plant control at these sites were divided amongst the cooperative partners. As well, weeds from 2008 at most priority sites were re-visited in 2009 and controlled, as necessary. Work was also initiated on a main entrance sign and other signs to be used in smaller, more localized infestations.

SRD spent significant amount of time and resources to work closely with Yellowhead County to develop and support the Yellowhead Invasive Plants Initiative. This year, SRD focused mainly on education and developing relationships with various stakeholders and the public. Yellowhead County and SRD participated in spraying herbicide on all infested vacant or county land. Various groups, including Yellowhead County staff and Junior Forest Rangers, got together to hand pull 1,134 kg (130 bags) of Canada thistle, oxeye daisy, wild caraway and blueweed from surrounding watersheds. Overall, information and work sharing programs have been met with the common goal of eradication, mitigation, education, prevention and cooperation of control work within the municipality and SRD boundaries.

Education and Public Awareness

Various invasive plant education and outreach activities were attended and/or organized by SRD. These included meetings and gatherings on invasive plants, information booths to promote invasive plant co-operatives and demonstrations to the public on importance of controlling invasive plants. For example, at last year's Death Race in Grand Cache a Forest Health booth was set-up and this was visited by over 400 people in a 2-day period.

In 2008, SRD was also involved in the Crown of the Continent (COC) Managers Partnership Project to develop an invasive plant guide. This multi-year effort involved municipal and provincial government land managers in southwest Alberta, southeast BC, and Montana; land managers in national parks on both sides of the border, and First Nation groups. While the guide was intended for the COC region, it is an excellent reference guide on many weed species, especially those not provincially legislated and many native look-alikes. This project was funded through grants.

SRD also hosted its 4th Annual Northeast Alberta Invasive Plant Workshop in Athabasca. This workshop is a part of SRD's cooperative invasive plant working group for the Waterways/Lac La Biche Area. Seventy-seven participants representing the oil and gas industry, forest product companies and consulting firms attended this event. With a large number of guest speakers, a variety of interactive activities and components such as a display comparing noxious weeds and look-a-like plants, the 2009 workshop was a huge success. The Alberta Invasive Plant Council's invasive

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ornamental plant list was also available for recognising introduction of invasive plants through horticulture and, importance of awareness and prevention. Presentations included invasive plant identification, biology, and management options; benefits of cooperative weed management; and, various examples of cooperative invasive plant management initiatives.

Several invasive plant pulling projects were also attended by Forest Health staff who provided information packages, answered questions and helped with hand-pulling of invasive plants.

Data Management

For the second year in a row, all SRD invasive plant survey and control data from SRD facilities and dispositions were entered into the Geographical Land Information Management & Planning System (GLIMPS) database. Control and compliance data based on 2009 re-inspections of 2008 control sites and letters that were sent from various stakeholders demonstrating control efforts will also be entered into GLIMPS.

Technology Development

Weed mapping took a technological leap this year with the adaptation of a tablet personal computer to collect weed data. The Senior Data Management Specialist in Edmonton created a weed application in tablet personal computers with fields and drop-down menus to collect data. With satellite imagery and Bluetooth GPS, nearly all aspects of weed mapping could now be carried out in the field. However, on occasion GPS satellite signal could not be obtained in the field. The size and location of weed infestations can now be tracked much more easily and accurately at a considerable saving of time taken in entering data at the end of the season.

Plans for 2010 Season

Activities planned for 2010 field season include controlling new infested SRD sites. Most sites will be sprayed but some, due to their proximity to watersheds, will require manual pulling. All sites that were either treated or re-inspected in 2009 will be monitored in 2010 summer to determine the efficacy of control efforts and will be controlled again, if necessary.

Strengthening cooperative management relationships between provincial industry and municipalities are on-going. In 2010 spring SRD is hoping to host invasive plant workshops with other agencies to help develop a platform to discuss importance of cooperative management areas and programs.

Goals for 2010 also include increasing public awareness of invasive plant species through trade shows and events, co-operative door-hanger programs with municipalities, school talks, Scouts Canada information sessions, as well as increasing signage in recreation and heavy-used areas throughout the province.

Figure 18
Occurrence of Canada thistle in 2009 in relation to its historical occurrence at SRD survey sites in Alberta.

Figure 19
Occurrence of common tansy in 2009 in relation to its historical occurrence at SRD survey sites in Alberta.

Figure 20
Occurrence of scentless chamomile in 2009 in relation to its historical occurrence at SRD survey sites in Alberta.

Figure 21
Occurrence of tall buttercup in 2009 in relation to its historical occurrence at SRD survey sites in Alberta.

Figure 22
Occurrence of oxeye daisy in 2009 in relation to its historical occurrence at SRD survey sites in Alberta.

Figure 23
Occurrence of wild caraway in 2009 in relation to its historical occurrence at SRD survey sites in Alberta.

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Appendix I

Land-use Framework Regions and Corporate Areas in Alberta, 2010